(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 153 894**
B1

(12) # EUROPEAN PATENT SPECIFICATION

(45) Date of publication of patent specification: **31.01.90**

(51) Int. Cl.[5]: **B 65 D 1/02**, B 29 C 49/00, B 29 C 49/22

(21) Application number: **85400386.0**

(22) Date of filing: **28.02.85**

(54) **Biaxially oriented plastic container with excellent heat-resistance and gas barrier properties.**

(30) Priority: **02.03.84 JP 40071/84**

(43) Date of publication of application:
04.09.85 Bulletin 85/36

(45) Publication of the grant of the patent:
31.01.90 Bulletin 90/05

(84) Designated Contracting States:
DE FR GB IT NL SE

(56) References cited:
EP-A-0 092 979
AU-B- 468 529
DE-A-2 112 942
DE-A-3 310 951

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Courier Press, Leamington Spa, England.

Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to a biaxially oriented container such as a bottle wherein two kinds of plastics are concentrically injected into a cavity to form a parison, and the parison is stretch-blow molded to obtain a section in the form of a three-layer, which is excellent in heat-resistance and gas barrier properties.

2. Prior Art

A biaxially oriented container having two surface layers and an intermediate layer insection obtained by concentrically injecting two kinds of plastics into a cavity to mold a bottomed parison and stretch-blow molding said parison, is known, f.i. from EP—A—0092979, the intermediate layer being formed of plastic with excellent gas barrier properties.

Plastics used for biaxially oriented containers include plastics, which have the gas barrier properties but are poor in heat-resistance, such as polyethylene terephthalate, vinyl chloride and vinylidene chloride, and plastics which have the heat-resistance but are poor in gas barrier properties, such as polycarbonate, polystyrene and polypropylene.

In bottles for carbonated drinks and the like, both pressure-resistance and gas barrier properties are regarded as important but for container for accommodating contents require heating when or after the container is filled, it is said that they should have the heat-resistance in addition to the gas barrier properties.

Accordingly, the plastics such as polycarbonate having the heat-resistance are poor in gas barrier properties, and therefore, they are difficult to be used for the packing containers. The polyethylene terephthalate which has the gas barrier properties and can withstand a filling temperature by heat treatment is widely used not only as containers for carbonated drinks but as packing containers for contents which require heating and filling.

However, since there is a limit in gas barrier properties and heat-resistance of polyethylene terephthalate, a means is merely left in which plastics accepted as a container material and plastics having the gas barrier properties or heat-resistance may be formed into a composite in order to obtain a packing container with excellent performances.

The plastics as a container may be formed into a composite by making a sectional composition of wall portions of the container a two-layer or a three-layer. However, in either case, both the gas barrier properties and heat-resistance are not yet enhanced by one layer.

SUMMARY OF THE INVENTION

This invention has been achieved in view of the above-described circumstances. An object of the invention is to provide a biaxially oriented, and preferably thin-wallthickness, container in which gas barrier properties and heat-resistance which are still insufficient are improved by the provision of a specific intermedaite layer inside plastics which form a container.

According to the present invention, the intermediate layer is made of a plastic having excellent gas barrier properties and containing glass fiber, the length of the glass fiber being in the range of 1 to 4 mm, and the percentage of glass fiber with respect to the plastics which forms the intermediate layer being 0,5—0,3 weight %.

Said glass fiber is used while being mixed with plastics having the gas barrier properties for the purpose of improving the fluidity at the time of injection as well as the heat resistance and the gas barrier properties.

It is known to use glass fiber to provide structural reinforcement of plastics (e.g. DE—A—2 112 942) but the specific introduction of glass fiber as teached by the invention is not disclosed nor suggested by the prior art.

The above-described plastics having the gas barrier properties include saponified ethylene-vinylacetate copolymer, ethylene-vinylalcohol copolymer, m-xylene-type polyamide, and polyethylene terephthalate.

Plastics for forming a container include polyethylene terephthalate, vinyl chloride, polystyrene, polypropylene, and polycarbonate, which are accepted as materials for containers, these material being acceptable as far as stretch-blow molding is possible to make.

The molding conditions of parisons required to obtain a biaxially oriented container according to this invention are determined by the molding conditions of plastics of which a container is formed. Even in the case where the glass fiber as the intermediate layer is simultaneously injected into the cavity, molding without major difference from the case of a single layer may be carried out without occurrence of bubbles as far as the glass fiber is sufficiently mixed with plastics for forming the intermediate layer along with the glass fiber and the same is charged with high back pressure.

Furthermore, even in stretch-blow molding of parisons, it is possible to obtain a biaxially oriented container having an intermediate layer without constituting an obstacle to axial stretching and radial expansion due to air pressure when the amount of glass fiber is in the range of 0.5—3.0 weight %.

BRIEF DESCRIPTION OF THE DRAWING

The single drawing is a partially enlarged longitudinal sectional view of a biaxially oriented container with excellent heat-resistance and gas barrier properties in accordance with this invention.

DETAILED DESCRIPTION OF THE INVENTION

In the figure, a reference numeral 1 designates a bottle, and a side wall 2 and a bottom wall 3 are molded into a three-layer in section. Two inner and outer layers 4 which forms the bottle 1 is formed from stretch-blow moldable thermoplastic resin.

A reference numeral 5 designates an intermediate layer, which comprises a material in which a glass fiber 6 is mixed into thermoplastic resin having gas barrier properties, the heat-resistance being imparted to the bottle 1 by the glass fiber 6. In this case, when the amount of glass fiber in the plastics exceeds 3.0 weight %, stretch-blow molding of the injection-molded bottomed parison becomes difficult, and if the content thereof is small in amount, the good result is not obtained.

The above-described bottle 1 may be very easily molded by already known means. This molding comprises positioning plastic of the intermediate layer 5 with glass fiber mixed therewith in the center of resin for forming the inner and outer layers 4, 4, injecting both materials into the cavity in a concentric fashion, and molding a bottomed parison which has three layers in section.

A thickness of the intermediate layer within said parison varies with the object of use of bottles molded, and the percentage between the inner and outer layers and the intermediate layer can be controlled at will by the injection quantity.

The aforesaid bottle 1 may be easily molded by axially stretching the parison by conventional means and expanding it by air pressure.

In the bottle 1 with glass fiber molded in the aforementioned process, the glass fiber is not exposed to the surface of the bottle 1 in the state it is contained inside, and therefore the external appearance as a bottle is not impaired and the shock strength in the bottom wall 3 of the bottle 1 increases, and therefore, it is possible to simplify the construction of the bottom as compared with a conventional bottle molded as a self-support bottle.

Next, examples and a comparative example are described.

Example 1

Inner and outer layers:
Polyethylene terephthalate
Intermediate layer:
saponified ethylene-vinylacetate copolymer
2 weight % of glass fiber (length: 3 mm)
Wall-thicknesses (mm):
Outer layer — 0.12, intermediate layer — 0.15 and inner layer — 0.14.

Example 2

Inner and outer layers:
Polyethylene terephthalate
Intermediate layer:
Polyethylene terephthalate
2.5 weight % of glass fiber (length: 3 mm)
Wall-thicknesses (mm):
Outer layer — 0.15, intermediate layer — 0.16 and inner layer — 0.11.

Comparative Example

Degree of shrinkage of 90°C hot water (%)	
Example 1	3.4—3.6
Example 2	3.2—3.4
*PET (single layer)	25—30

* The bottle of PET (polyethylene terephthalate) is so deformed that the external appearance is disappeared but those in Examples 1 and 2 show no variation in external appearance. In addition, the gas barrier properties are also enhanced as compared with the case of the single layer.

Claims

1. A biaxially oriented container (1) having two surface layers (4,4) and an intermediate layer (5) in section obtained by concentrically injecting two kinds of plastics into a cavity to mold a bottomed parison and stretch-blow molding said parison, said intermediate layer (5) of said container being formed of plastic with excellent gas barrier properties, characterized in that the intermediate layer (5) contains glass fiber (6), said glass fiber (6) having a length of 1—4 mm and being contained in a percentage of 0.5—3.0 weight % with respect to plastic which forms the intermediate layer (5), whereby said container has excellent heat-resistance and gas barrier properties.

2. A biaxially oriented container (1) with excellent heat-resistance and gas barrier properties as defined in Claim 1 in which said intermediate layer (5) consists of plastic material selected from the group consisting polyethylene terephthalate, saponified ethylene-vinylacetate copolymer, ethylene-vinylalcohol copolymer, and m-xylene-type polyamide.

Patentansprüche

1. Zweiachsig orientierter Behälter (1) mit zwei Oberflächenschichten (4, 4) und einer dritten Zwischenschicht (5), die durch koaxiales Spritzgießen von zwei Kunststoffen in einen Hohlraum erhalten sind, um einen mit einem Boden versehenen Külbel zu formen und diesen Külbel durch Streckblasen zu formen, wobei die Zwischenschicht (5) des Behälters aus einem Kunststoff mit hervorragenden Gasbarriere-Eigenschaften geformt ist, dadurch gekennzeichnet, daß die Zwischenschicht (5) Glasfasern (6) in einer Länge von 1 bis 4 mm zu einem Anteil von 0,5 bis 3,0 Gewichtsprozent bezüglich des die Zwischenschicht 5 bildenden Kunststoffes enthält, so daß der Behälter hervorragende Hitzebeständigkeit und Gasdichtheit hat.

2. Zweiachsig orientierter Behälter (1) mit hervorragender Hitzebeständigkeit und Gasdichtheit nach Anspruch 1, bei dem die Zwischenschicht (5) aus einem Kunststoff aus der Gruppe Polyethylen-Terephthalat, verseiftes Ethylen-Vinylazetat-Kopolymer, Ethylen-Vinylalkohol-Kopolymer und M-Xylen-Polyamid besteht.

Revendications

1. Un récipient orienté biaxialement (1) ayant deux couches de surface (4,4) et une couche intermédiaire (5) en section obtenu en injectant

de façon concentrique deux sortes de matières plastiques dans une cavité afin de mouler une paraison comportant un fond et de mouler par étirage et soufflage ladite paraison, ladite couche intermédiaire (5) dudit récipient étant formée de matière plastique présentant d'excellentes propriétés de barrière contre les gaz, caractérisé en ce que la couche intermédiaire (5) contient de la fibre de verre (6), ladite fibre de verre (6) ayant une longueur de 1—4 mm et étant contenue dans des proportions de 0,5—3,0% en poids par rapport à la matière plastique qui forme la couche intermédiaire (5), ledit récipient présentant par là même d'excellentes propriétés de résistance à la chaleur et de barrière contre les gaz.

2. Un récipient orienté biaxialement (1) présentant d'excellentes propriétés de résistance à la chaleur et de barrière contre les gaz selon la revendication 1, dans lequel ladite couche intermédiaire (5) est composée de matière plastique choisie dans le groupe constitué par le téréphthalate de polyéthylène, le copolymère acétate de vinyléthylène saponifié, le copolymère éthylène-alcool vinylique, et le polyamide de type m-xylène.

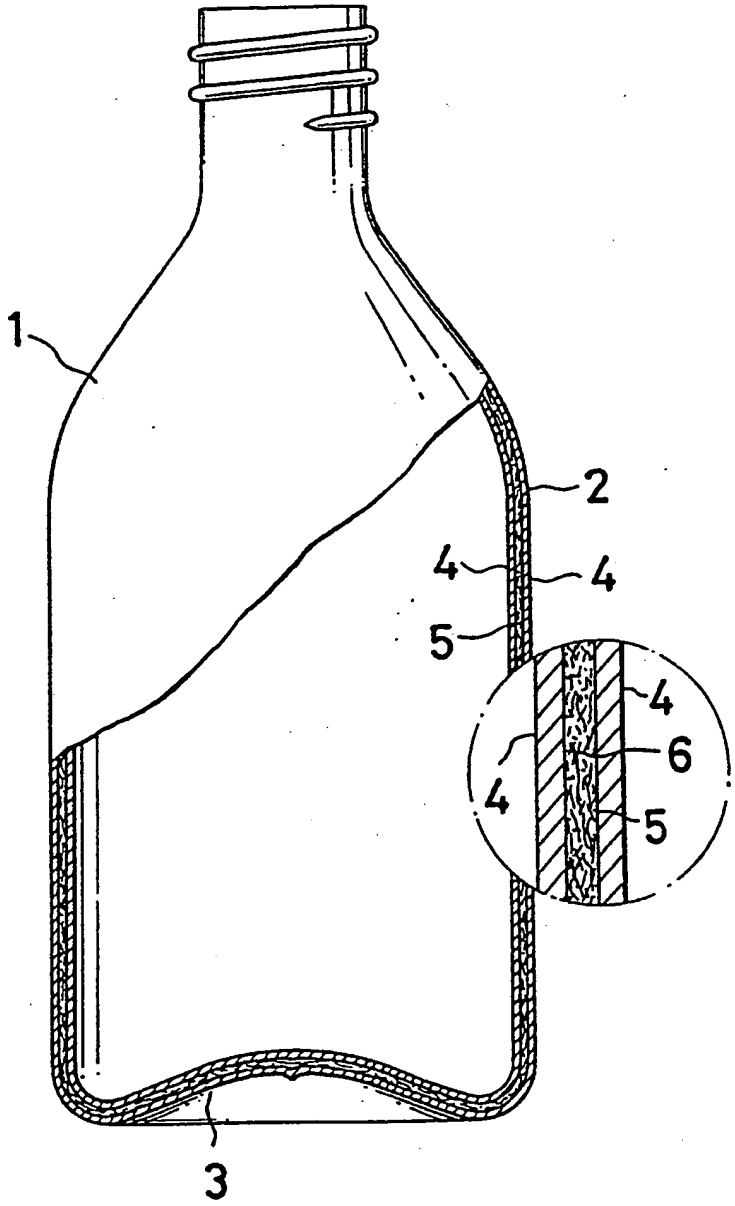

FIG. 1

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